QUALISYS
Motion Capture Systems

Underwater Motion Capture

Qualisys provides motion capture cameras suitable for all possible environments, including indoor, outdoor and even underwater captures. Our underwater cameras are the world's only commercially available optical motion capture cameras for underwater use and are designed for mobility, robustness and trouble-free operation.

Qualisys underwater cameras are enclosed in waterproof housing and equipped with a strobe built specifically for underwater use. Each camera is pressure tested to 5bar (40m/130ft depth).

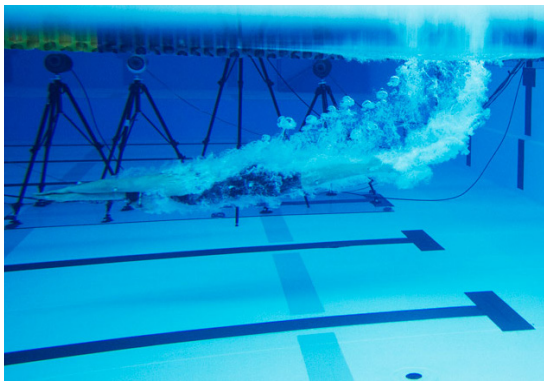
The system can be synchronized with external hardware just like any other Qualisys motion capture system. Naturally, Qualisys Track Manager takes full advantage of all the features of the cameras and allows streaming and exporting of 3D and 6DOF data to 3rd-party applications in real-time.

FEATURES

- High-speed underwater motion capture
- Underwater video with full HD @ 85 fps
- Resolution: 2, 4, 9 and 12 MP
- Low latency for real-time applications
- Underwater: IP68 housing pressure tested to 5bar (40m/130 ft depth)
- Integrated high-power LED strobe
- Combined gigabit Ethernet and power cable
- Stainless steel and polycarbonate underwater housing
- Up to 30 meters (100ft) range

[1] Optional accessory/feature, not available for all camera models.

Applications

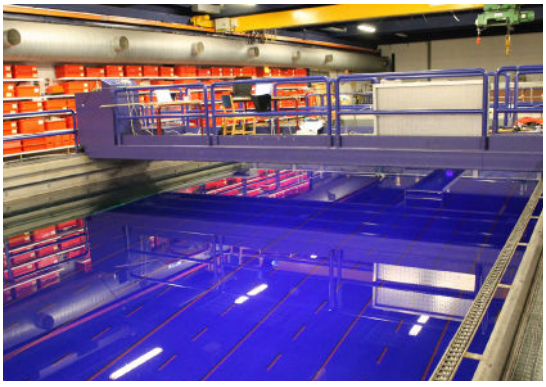


Analyze all phases of the lap, including start, on-block, flight, the underwater phase, and all the way to the 15m (50ft) point using a Qualisys system.

UNDERWATER BIOMECHANICS

Qualisys have many customers within underwater biomechanics using underwater cameras. Examples include lower body gait analysis for in-water rehabilitation using underwater treadmills.

Another example is studying the kinematics of swimmers, where researchers and coaches use data collected by the underwater motion capture system to analyze the athlete's dive and stroke. It is also possible to combine Qualisys underwater cameras with the skeleton solver functionality in QTM to capture underwater motions performed by actors in games and films.



Arqus A9UW or A12UW can be used for large volume marine measurements, such as large Ocean basins and towing tanks.

MARINE

An underwater motion capture system is an essential tool in the testing and developing of underwater vehicles and equipment. Examples of use include the tracking of free-running AUVs, underwater objects towed in a towing tank, mooring lines, fishnet trawl doors, and oil pipeline motions, to mention a few.

The Arqus A12UW is well-suited to track motions in large areas with a measurement range of up to 30 meters (100ft). With its wide field of view, the smaller Miqus Underwater is the better choice in spaces like narrow tanks or small pools.

CAMERA SELECTION GUIDE FOR UNDERWATER MEASUREMENTS

Requirement	Miqus M3UW	Miqus M5UW	Arqus A9UW	Arqus A12UW	Miqus Video UW
3D tracking capabilities	✓	✓	✓	✓	✗
Synchronized color video	✗	✗	✗	✗	✓
Distances longer than 15m (50 ft)	✗	~	✓	✓	✗
Fast movement, high frame rate	✓	~	✓	✓	~
Wide FOV for narrow underwater spaces	✓	✓	✓	~	✓

Recommended ✓ *Possible* ~ *Not recommended* ✗

Products

ARQUS UNDERWATER

The Arqus underwater cameras are robust, high resolution cameras for medium to long-range measurements. The camera is equipped with a powerful strobe with better light distribution compared to its predecessor Oqus Underwater. The cameras is also smaller and lighter with improved mounting and offers longer measurement distances.

Both Miqus and Arqus have custom-designed housing made of marine grade stainless steel and polycarbonate/acrylic with high corrosion resistance and are pressure tested to 5bar (40m depth).

Arqus Underwater is a robust, high resolution camera primarily suited for medium to long-range measurements, from 7-30m (25 - 100ft).

MIQUS UNDERWATER

The smaller, more nimble Miqus opens up new possibilities for underwater measurement in confined spaces. At just over 2kg, the Miqus is half the weight compared to the Arqus series. Its wide field-of-view enables deployment in small tanks or pools with short distance to the subject.

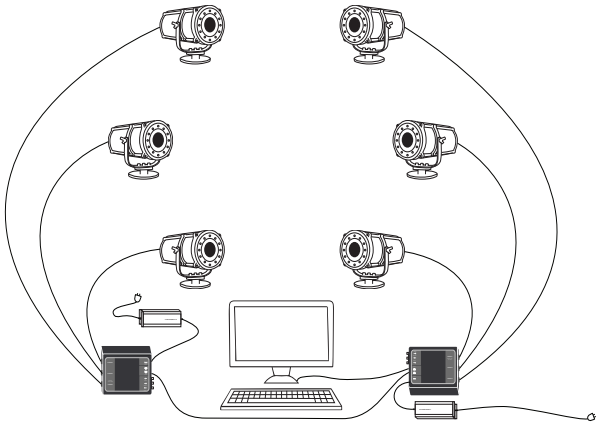
Miqus Underwater cameras are ideal to use in small to medium sized volumes, up to 15m (50ft) range.

SYNCHRONIZED UNDERWATER VIDEO

Miqus Underwater video can be synchronized and calibrated together with the motion capture cameras to enable 3D video overlay. It can be used as a standalone video solution, bridging the gap between small, hand-held consumer devices and more expensive cameras that are typically used in industrial settings. The Miqus Underwater video camera streams MJPEG compressed, full HD video in 85 fps over standard gigabit Ethernet.

COMBINING ABOVE AND UNDERWATER

By combining Qualisys groundbreaking underwater cameras with an above water camera system, in what is known as a 'Twin system' setup, above- and underwater movement can be merged together into a single capture.



SYSTEM CONNECTION

Each camera has a high-quality underwater connector, which connects to a water-protected connection unit placed on land. This cable carries both power and data.

A connection unit drives up to three underwater cameras from one power supply and several connection units can be connected, either daisy-chained or in a star configuration.

Technical specifications

UNDERWATER VIDEO

		Miqus Video Monochrome	Miqus Video Color
Resolution		2.0 MP / 1920 x 1088	2.0 MP / 1920 x 1088
Frame rates	**Full HD 1080p**	85	85
	HD 720p	180	180
	0.5Mp	330	330
	VGA	550	550
Underwater FOV		60° x 40°	60° x 40°
Color		No	Yes
Auto exposure		Yes[1]	Yes[1]
White balance		N/A	Auto
Max calibration distance		15	10

[1] *possible to switch to manual*

UNDERWATER MOCAP CAMERAS

	Miqus M3UW	Miqus M5UW	Arqus A9UW	Arqus A12UW
Pixels	2 MP	4 M	9 MP	12 MP
Resolution	1824 x 1088	2048 x 2048	4224 x 2160	4096 x 3072
Frame rate	340 fps	180 fps	300 fps	300 fps
Underwater FOV	58° x 40°	51° x 51°	61° x 33°	40° x 31° (motorized)
Measurement distances with 19 mm markers[2]	14 m	17 m	23 m	30 m
Underwater housing	Stainless steel and acrylic	Stainless steel and acrylic	Stainless steel and Polycarbonate	Stainless steel and Polycarbonate
Length	250 mm / 9.8 in	250 mm / 9.8 in	166 mm / 6.5 in	166 mm / 6.5 in
Diameter	110 mm / 4.3 in	110 mm / 4.3 in	177 mm / 7.0 in	177 mm / 7.0 in
Weight	2.5 kg / 5.5 lbs	2.5 kg / 5.5 lbs	4.0 kg / 8.8 lbs	4.0 kg / 8.8 lbs
Buoyancy	Neutral	Neutral	Slightly negative	Slightly negative
Operating temperature range	0-35°C (32-95°F)	0-35°C (32-95°F)	0-35°C (32-95°F)	0-35°C (32-95°F)
Operating voltage	24 VDC	24 VDC	24 VDC	24 VDC

[2] *dependent on capture water turbidity*